SYNERGY POWER MANUFACTURING SDN BHD v. KETUA SETIAUSAHA KEMENTERIAN KEMAJUAN LUAR BANDAR DAN WILAYAH & ANOR

HIGH COURT MALAYA, KUALA LUMPUR
MARY LIM J
[CIVIL SUIT NO: 21C-1-03-2014]
7 JANUARY 2015

CONTRACT: *Breach – Agreement – Contract to supply, install, test and commission hybrid system to selected villages – Plaintiff's claim for sums due under contract – Whether hybrid system had to be tested and commissioned before plaintiff could make claims – Terms of contract relating to guaranteed performance of system – Whether fulfilled – Failure to provide and install equipment for measuring and recording of energy – Whether plaintiff met requirements of clauses in contract – Whether plaintiff entitled to balance sum and retention sum of contract – Whether plaintiff discharged burden of proving case on a balance of probabilities*

CONTRACT: *Claims – Sums due under contract – Whether plaintiff entitled to claim for balance sum and retention sum of contract – Contract to supply, install, test and commission hybrid system to selected villages – Whether hybrid system had to be tested and commissioned before plaintiff could make claims – Terms of contract relating to guaranteed performance of system – Whether fulfilled – Failure to provide and install equipment for measuring and recording of energy – Whether plaintiff met requirements of clauses in contract – Whether there was a breach – Whether plaintiff discharged burden of proving case on a balance of probabilities*

The plaintiff, an integrated renewable energy resources company who manufactures wind turbines and remote area power systems, held a patent for a wind turbine technology dedicated to small wind turbines in several countries, including Malaysia. The defendants were interested in installing such a system in its remote areas. The plaintiff was awarded 'Projek Bekalan Elektrik Luar Bandar secara hybrid (wind turbine/solar/set generator) untuk Sabah dan Sarawak' for RM20 million ('the said project') subject to terms and conditions in the letter of acceptance and a formal contract that was entered into between the parties ('the said contract'). The said contract essentially involved supplying, transporting, installing, testing and commissioning of the hybrid system to four selected villages *ie*, Kg Tinaum and Kg Mengkapoh in Sabah involving 65 and 66 houses respectively; and Kg Telok Melano and Kg Arul Dalan in Sarawak involving 52 houses and 44 houses respectively. Once the hybrid system was installed, each of these houses would have daily energy capacity of 4KWh with at least 70% of that energy coming from renewable sources of wind and solar. The balance 30%

would be sourced from the generator set. The plaintiff had been substantially paid when the parties fell into dispute over the last leg of the execution of the said contract; and that was in respect of the testing and commissioning of the system that the plaintiff had installed. According to the defendants, who had conducted the testing and commissioning in the presence of representatives from the plaintiff and Sarawak Energy Bhd who would eventually take over the said project, the plaintiff had failed to meet the terms of the terms of reference ('TOR') despite the numerous testings and commissioning conducted. It was the crux of the plaintiff's case that it had passed all the necessary testing and commissioning and that it was therefore entitled to the balance sum of RM3,616,608.84 as well as the retention sum of RM1 million. The defendants, however, contended otherwise. The central question that arose was whether the testing and commissioning which was conducted by the plaintiff complied or fulfilled the requirements or terms and conditions of the terms of reference and terms of the said contract.

Held (dismissing plaintiff's claim with costs):

(1) The object of testing was obvious from cl. 47.1 of the said contract which was to prove that the equipment had been properly adjusted and calibrated to produce the required guaranteed performance as offered and that the system as a whole could perform the performance and functions as specified. It was the plaintiff's responsibility to arrange for the necessary testing to be done and to ensure that 'necessary equipment, tools, materials, labour' as were required for the testing were provided. The hybrid system in all four villages had to be tested and commissioned before the plaintiff could make its claim on the last sums due under the said contract. (paras 15, 16 & 24)

(2) The testings done at Kg Telok Melano were not successful in that the terms of the TOR of the said contract relating to guaranteed performance and functions of the system had not been fulfilled. Another set of tests were subsequently conducted at Kg Telok Melano by the plaintiff's consultant, Mega Jati Consult Sdn Bhd, between 25 August 2010 and 2 September 2010. All the defendants' witnesses had given corroborative and consistent testimonies. DW1, DW2 and DW3 were members of the technical teams for the villages involved and their evidence had been firm, credible and consistent. These witnesses have been totally professional in their conduct and approach; and were merely evaluating the testings and commissioning against the terms of the TOR and the said contract. The empirical data collected from the various tests spoke for themselves, which was further supported by those collected by the plaintiff's own consultant. Compared to PW1, the plaintiff's sole witness, who was relying on Mega Jati's report with no personal

knowledge of the tests conducted, the defendants' witnesses were witnesses of facts learnt first-hand and certainly, more believable than PW1's testimony. (paras 40, 46 & 47)

(3) After the tests in April 2010, the plaintiff's own consultant made recommendations for further action. Such action which included the very comments and concerns raised by the defendants had testified that there were no meters for the measuring and recording of the energy produced by the wind turbines and solar systems. The provision and installation of such equipment was vital and necessary for evaluating whether the equipment and installation were proved to be as offered and specified in the TOR. The plaintiff was responsible for providing the equipment for testings and commissioning, which equipment must include such meters, yet none were provided. There was a curious absence of explanation as to why this equipment was not supplied. Under such circumstances, the plaintiff could not now complain. (para 49)

(4) From the reports, the findings for each village revealed that the hybrid system had failed. The system frequently 'tripped' and the generator sets installed for taking over the load themselves failed. The testings and commissioning had therefore failed. This was in fact the view of the plaintiff's own consultant who, if it were otherwise, that the plaintiff had passed those tests and that the system could then be commissioned, the consultant would have said so clearly and emphatically. At no time did the consultant conclude that the tests met the terms of the TOR. (paras 52, 53 & 54)

(5) Evidence showed that the energy emitted from the solar panels fell below that warranted by the plaintiff itself. Instead of producing 14.4 KWh per day, the solar panels were only able to produce around 9KWh per day. As for the generator set, it was supposed to contribute 70.8 KWh per day, that was, more than it was supposed to. Since the sources of energy was central and critical to the system, it was fair and reasonable for the defendants to require proof that the basic terms and requirements of the TOR and the said contract had been met. Given such empirical data with no information or clarification to contradict or explain otherwise, the court accepted the evidence of the defendants' witnesses. The plaintiff could not be said to have met the requirements of cl. 47. (paras 54 & 55)

(6) The fact that the plaintiff had to carry out so many tests was in itself evidence that the first of the tests had failed, requiring therefore further tests. It was apparent from the trail of correspondence exchanged between the parties that the matter of the testing and commissioning

under the terms of the said contract remained unfulfilled. It was not enough that a system worked on papers, it had to work on the scale ordered. Hence, the requirement for testing and commissioning. With the abundance of records reflecting the numerous failures, most critical of which was that concerning the sources of energy, the conditions of the TOR and the said contract had simply not been met. The plaintiff had failed to discharge its burden of proving its case on a balance of probabilities. (paras 56 & 57)

Case(s) referred to:

*Johara Bi Abdul Kadir Marican v. Lawrence Lam Kwok Fou & Anor [1980] 1 LNS 199 FC **(refd)***

*Malaysia British Assurance Bhd v. Syarikat Pembenaan Karun Sdn Bhd [2009] 4 CLJ 1 CA **(refd)***

For the plaintiff - Hazman Ahmad (Ariff Amirul Abdul Jani with him); M/s Omar Ismail Hazman & Co

For the defendants - Azlina Mahmood; SFC

Reported by Suhainah Wahiduddin

JUDGMENT

Mary Lim J:

Facts

[1] The plaintiff is an integrated renewable energy resources company. It manufactures wind turbines and remote area power systems. Established in 2010 and located in Shah Alam, Selangor, it holds a patent for a wind turbine technology dedicated to small wind turbines in several countries, including Malaysia. The turbines work with a very low speed of 4.5 m/s of wind. The defendants were interested in installing such a system in its remote areas.

[2] Pursuant to letter of acceptance dated 3 September 2007, the plaintiff was awarded a project known as "Projek Bekalan Elektrik Luar Bandar (BELB) secara hybrid (wind turbine/solar/set generator) untuk Sabah dan Sarawak" for RM20 million (the said project) subject to terms and conditions to be found in the letter of acceptance and a formal contract that would be entered into between the parties. Indeed, the parties subsequently entered into a formal written contract on 19 November 2008 (the said contract).

[3] The said contract essentially involved supplying, transporting, installing, testing and commissioning of the hybrid system to four selected villages, two located in Sabah and two in Sarawak. The two villages in Sabah are Kg Tinaum and Kg Mengkapoh in Ranau involving 65 and 66 houses respectively; and Kg Telok Melano in Lundu, Sarawak involving 52 houses and Kg Arul Dalan in Bario, Sarawak involving 44 houses. Once the hybrid

system was installed, each of these houses will have daily energy capacity of 4 KWh with at least 70% of that energy coming from renewable sources of wind and solar. The balance 30% would be sourced from the generator set.

[4] Article 4 of the said contract provides for the reading of several documents as comprising the contractual arrangements between the parties. The court will therefore read and construe all these documents as a whole in order to understand the intention of the parties. The court will also construe these documents "according to its sense and meaning as collected from the words used in it, which are to be understood in their plain and ordinary meaning" as reminded by the Court of Appeal in *Malaysia British Assurance Bhd v. Syarikat Pembenaan Karun Sdn Bhd* [2009] 4 CLJ 1; [2008] 6 MLJ 533. These documents are:

> Article 4
>
> The following documents (hereinafter collectively called the 'Contract Documents') shall be deemed to form and be read and construes as part of this Contract:
>
> (i) the Articles of Agreement;
>
> (ii) the Conditions of Contract and the Appendices annexed thereto;
>
> (iii) the Government's Requirements including Instructions to Tenders;
>
> (iv) the Contractor's Proposal including drawings and Specifications;
>
> (v) the Contract Sum Analysis;
>
> (vi) the Contract Schedule of Rates (if any);
>
> (vii) the Form of Tender; and
>
> (viii) the Letter of Acceptance.

[5] The defendants' requirements and instructions under the said contract are *inter alia* reflected in the minutes of meetings dated 29 May 2007 and 11 June 2007 between the parties prior to the letter of acceptance. These minutes also formed part of the contract documents and they can be found in the Appendices annexed to the General Conditions of Contract. Further, read together with cl. 50 of the General Conditions of Contract, the terms of payment are as follow:

> Power Systems
>
> | | |
> |---|---|
> | 1. Upon Completion of Engineering Designs | 30% |
> | 2. Upon Completion of Power Systems Fabrication and Factory Performance Tests | 60% |
> | 3. Upon Site Testing and Commissioning | 10% |
>
> Transmission and Distribution Systems
>
> | | |
> |---|---|
> | 1. Upon Completion, Testing and Commissioning | 100% |

[6] The Terms of Reference (TOR) also form part of the said contract and the details are as follow:

BIL	PERKARA	TERMS OF REFERENCE
1.	Siling Kontrak	Harga siling kontrak adalah berjumlah RM20.0 juta seperti yang telah diputuskan oleh Kementerian Kewangan.
2.	Tempoh Pelaksanaan Projek	Tempoh pelaksanaan projek dari tarikh milik tapak adalah selama 18 bulan. Projek hanya dianggap sebagai siap setelah SESCO dan SESB mengeluarkan perakuan siap kerja kepada kontraktor.
3.	Skop Kerja Kontraktor	i. Skop kerja kontraktor meliputi kerja-kerja pembinaan stesen penjanaan, pembinaan talian penghantaran dan pengagihan serta lain-lain kerja berkaitan sehingga pengguna selesa menerima pakai bekalan elektrik. Pendawaian dalam rumah berada di luar skop projek dan akan ditanggung sendiri oleh pengguna. ii. Bertanggungjawab mendapatkan kebenaran izin lalu dan mendapatkan kebenaran masuk ke tapak dari pihak berkaitan sebelum kerja-kerja pemasangan dapat dimulakan. iii. Apabila siap kelak, projek akan diserahkan kepada SESCO di Sarawak dan SESB di Sabah bagi tujuan operasi dan penyenggaraan secara sistematik dan berterusan. iv. Pengguna akan dikenakan bil bulanan dan dikutip oleh Pihak Berkuasa Elektrik Negeri (PBEN) iaitu SESCO di Sarawak dan SESB di Sabah.
4.	Rekabentuk Teknikal	i. Kontraktor perlu memastikan kapasiti bekalan kuasa daripada renewable energy (wind-turbine dan solar system) direkabentuk pada kadar full load di setiap kampung. Walau bagaimanapun, purata penggunaan keseluruhan adalah berdasarkan 70% bekalan daripada wind-turbine dan solar system. 30% lagi adalah dari generator. ii. Sistem hendaklah dilengkapi dengan current limiter untuk memantau dan memastikan penggunaan tidak lebih daripada 4 KW/h bagi setiap rumah. iii. Lawatan dan penilaian tapak perlu dibuat sebelum pemasangan dibuat. Laporan tersebut perlu dikemukakan kepada kerajaan. iv. Setiap rekabentuk, pengiraan, pengujian dan penilaian terperinci setiap tapak perlu diluluskan oleh juruperunding dan hendaklah dikemukakan kepada kerajaan sebelum pemasangan dibuat.

5.	Wind-turbine	i. Hendaklah menghasilkan 100% kuasa pada kelajuan angin Kelas 2 (4-5m/s) ii. Spesifikasi bagi mast hendaklah mematuhi Australian Standard dan mampu bertahan pada kelajuan angin 100km/j.
6.	Solar	i. Pemasangan hendaklah di atas concrete platform dan dipagar untuk mengelak vandalisme dan mengurangkan kos penyelenggaraan. ii. Pemasangan tiang hendaklah mematuhi Australian Standard dan mampu bertahan pada kelajuan angin 100 km/j.
7.	Bateri	i. Kapasiti bateri hendaklah direkabentuk untuk kapasiti full load (4 KWh/hari/rumah x 50 rumah 200 KWh/hari) bagi setiap kampung dengan autonomi selama 2 hari. ii. Bateri adalah jenis Maintenance free dan mempunyai jangka hayat di antara 7-10 tahun. iii. Tempat pemasangan dan penyimpanan bateri hendaklah di tempat yang sesuai lengkap dengan sistem pengudaraan dan keselamatan. iv. Sistem bateri hendaklah dilengkapi dengan sistem perlindungan untuk menjaga jangka hayat bateri. Bateri tidak boleh dinyahcas sepenuhnya dan perlu ada mekanisme yang memutuskan bekalan daripada bateri apabila bekalan mencapai tahap nyahcas yang rendah.
8.	Generator	Kapasiti generator hendaklah direkabentuk berdasarkan full load bagi setiap kampung. Walau bagaimanapun penggunaan hanyalah bagi tujuan penggunaan purata 30% sahaja.
9.	LV Distribution	Pemasangan hendaklah mematuhi standard dan spesifikasi JKR/SESB/SESCO dan menggunakan jenama peralatan-peralatan yang diluluskan.
10.	Pemasangan	Sebarang kerja-kerja untuk membersihkan dan meratakan kawasan, menebang pokok, menaikkan paras kawasan, pengukuhan tanah di lokasi pemasangan sistem di tapak adalah menjadi tanggungjawab kontraktor sepenuhnya.
11.	Bangunan untuk penyimpanan peralatan sistem	i. Rekabentuk bangunan perlu diluluskan oleh juruperunding dan dikemukakan kepada kerajaan sebelum pemasangan dibuat. ii. Pemasangan hendaklah mematuhi standard dan spesifikasi JKR.

		iii. Perlu dilengkapi dengan sistem pengudaraan dan keselamatan. iv. Saiz ruang yang sesuai bagi tujuan pengoperasian dan penyelenggaraan. v. Rekabentuk dan lokasi bangunan mengambil kira keadaan persekitaran. (Kawasan banjir, berbukit, tanah lembut dan sebagainya).
12.	Penyelenggaraan	i. Preventive maintenance hendaklah dibuat secara berkala sekurang-kurangnya 4 kali setahun selama 24 bulan. ii. Corrective maintenance bagi setiap kerosakan sistem selama 24 bulan dari tarikh siap projek. Tempoh tindakan pembaikan bagi setiap kerosakan hendaklah tidak melebihi 7 hari.
13.	Latihan	i. Latihan kepada pegawai dan Kementerian dan Pihak Berkuasa Elektrik Negeri dari segi operasi dan selenggaran. ii. Pendedahan penggunaan sistem kepada wakil setiap kampung.

[7] The plaintiff had been substantially paid when the parties fell into dispute over the last leg of the execution of the said contract; and that is in respect of the testing and commissioning of the system that the plaintiff had installed. This is evident from the pleadings filed.

[8] According to paras. 29 and 30 of the statement of claim, the following attempts were made at testing and commissioning at the four villages concerned:

> 29. Plaintif juga telah melakukan pengujian dan pertauliahan sebanyak 3 Kali seperti tarikh berikut:
>
> (a) Pengujian dan Pertauliahan Pertama: 09/09/2009-11/09/2009
>
> (b) Pengujian dan Pertauliahan Kedua: 14/12/2009-20/12/2009
>
> (c) Pengujian dan Pertauliahan Ketiga: 07/04/2010-27/04/2010
>
> 30. Melalui surat bertarikh 11/01/2010, Defendan Pertama telah membuat ulasan mengenai ketidaksempurnaan sistem yang dipasang semasa sesi pengujian dan pertauliahan sebelum ini.

[9] To this, the defendants' responded at para. 24 of the defence:

> 24. Merujuk kepada 29 dan 30 Pernyataan Tuntutan, Defendan-Defendan menyatakan seperti berikut:
>
> (a) Pengujian kali pertama sistem telah dijadualkan pada 9 hingga 11 September 2009 di Telok Melano, Sarawak. Bagaimanapun, pengujian bersama pihak Plaintif tidak dapat diteruskan kerana pihak

Plaintif dan Perunding yang dilantik tidak menyediakan peralatan pengujian sistem yang lengkap seperti "dummy load" dan KWh Meter.

(b) Pengujian sistem kali ke dua telah dijadualkan bersama Plaintif pada 14 - 20 Disember 2009 juga di Telok Melano. Sesi pengujian ini telah dihadiri oleh pihak Plaintif, Juruperunding yang dilantik oleh Plaintif dan wakil Sarawak Energy Berhad (SEB). Atas persetujuan Plaintif sesi pengujian sistem diteruskan dan keputusan ujian berkenaan adalah seperti berikut:

(i) Penjanaan tenaga diperoleh daripada bateri yang telah dicaj penuh menggunakan set generator diesel. Tiada penjanaan kuasa direkodkan daripada sumber tenaga boleh baharu (angin).

(ii) Analisa yang dibuat menunjukkan bahawa perbekalan tenaga elektrik ke rumah-rumah penduduk kampung diperoleh daripada penstoran bateri. Perkara ini tidak memenuhi TOR dan kontrak iaitu 70% penjanaan tenaga perlu diperoleh daripada sumber tenaga boleh baharu (angin dan solar).

(iii) Laporan daripada pihak perunding juga mengesahkan bahawa tiada penjanaan tenaga diperoleh daripada sumber tenaga boleh baharu (angin).

(c) Pengujian kali ketiga telah dijalankan pada 6 - 8 April 2010 juga di Telok Melano, Sarawak dan dihadiri oleh Plaintif, Juruperunding yang dilantik oleh plaintif dan wakil Sarawak Energy Berhad.

(i) Berdasarkan analisa KKLW, kapasiti beban yang dikira untuk tujuan pengujian adalah berdasarkan kepada 52 bilangan rumah.

(ii) Sumber bekalan elektrik masih diperoleh daripada penstoran bateri yang telah dicaj penuh menggunakan set generator diesel.

(iii) Tiada meter KWh dipasang untuk merekodkan jumlah penjanaan tenaga daripada sumber tenaga boleh baharu (angin dan solar).

(v) Kesimpulan sesi pengujian ini juga menunjukkan bahawa sistem yang dibina tidak memenuhi TOR dan kontrak yang ditetapkan iaitu penjanaan tenaga sebanyak 70% daripada sumber tenaga boleh baharu.

[10] This was the plaintiff's reply to these allegations as found at para. 27:

27. Plaintif merujuk kepada perenggan 24(a) hingga (c) Pernyataan Pembelaan dan menyatakan seperti berikut:

(i) Plaintif menafikan perenggan 24 (a) Pernyataan Pembelaan dan menyatakan bahawa Plaintif telah menyediakan "dummy load" untuk pengujian tetapi Defendan Pertama mahu menggunakan "dummy load" yang lain daripada yang telah disediakan.

A (ii) Plaintif juga menegaskan bahawa semasa pengujian dan pertauliahan, beban sebenar harus digunakan dan bukanlah "dummy load" namun Defendan Pertama telah gagal untuk menyediakan pendawaian di dalam rumah seperti tertakluk di dalam Bil 3(i) di dalam TOR di mana pendawaian di dalam rumah berada di luar skop kerja Plaintif.

B (iii) Plaintif merujuk kepada perenggan 24(b) Pernyataan dan menyatakan bahawa pengujian sistem kali ke dua di Telok Melano telah dilakukan sewaktu kitaran angin yang rendah. Ini telah menyebabkan kekurangan sumber daripada kincir angin.

C (iv) Merujuk kepada perenggan 24(c)(iii) dan Plaintif telah menyediakan KWh meter untuk SISTEM dan set generator yang diperlukan seperti di dalam TOR.

(v) Plaintif menafikan perenggan 24(c)(iv) dan menegaskan laporan yang dikemukakan kepada Defendan Pertama telah menunjukkan bahawa purata operasi set generator adalah sebanyak 30% manakala
D 70% dari purata operasi SISTEM dan ini telah memenuhi seperti yang tertakluk di dalam kontrak.

[11] As can be seen, it is the crux of the plaintiff's case that it had passed all the necessary testing and commissioning and that it was therefore entitled to the balance sum of RM3,616,608.84 as well as the retention sum of RM1
E million. The defendants contended otherwise.

[12] The parties agreed to the disposal of the case upon the determination of this central question, that is whether the testing and commissioning which was conducted by the plaintiff complied or fulfilled the requirements or terms and conditions of the terms of reference and terms of the said contract.

F

[13] With this focused issue, the plaintiff called its single witness in the person of Indera Shaiful bin Baharuddin (PW1) while the defendants' called three witnesses, namely Md Rais bin Yaakob (DW1); Salizawati binti Hj Shamsuddin (DW2); and Rofino Anak Rantai (DW3).

G **Determination**

[14] The fact that testing and commissioning will have to be conducted is not in dispute. This is self-evident from cl. 47 of the said contract:

47. Testing and Commissioning of Mechanical, Electrical and other
H Services

47.1 The Contract shall include for the testing and commissioning of the installation to prove that the equipment has been properly adjusted and calibrated to produce the required guaranteed performance as offered and that the system as a whole can perform the performance and functions as specified. Hence on completion of the installation
I work on the Site the Contractor shall also arrange for all necessary

tests, to be carried out on the equipment and installation as required by statutory regulations and by-laws. The contractor shall also perform all other tests, which may be specified elsewhere in the contract. The costs of all tests including the provision of necessary equipment, tools, materials, labour and all other expenses shall be deemed to be included in the Contract Sum.

47.2 In the event of installation failing to pass these tests, the Contractor should take such measures as are necessary to remedy the installation including the replacement of part or whole of the equipment installed so as to pass all necessary tests. The whole installation shall not be considered as complete until all such tests have been passed.

47.3 The Contractor shall notify the P.D. when the tests are to be conducted so that the P.D. or his representatives may be present to witness such tests. A test programme should also be submitted by the Contractor.

47.4 Further adjustments to the controls shall also be made whilst the building is occupied and the installation is in use during the Defects Liability Period. No additional cost shall be charged in carrying out these adjustments.

47.5 A complete record of the tests and results of such tests (whether successful or otherwise) shall be kept up-to-date by the Contractor. At the conclusion of all the tests, these records shall be collected and two bound sets provided to the P.D.

47.6 On successful testing of the complete installation, the Contractor shall arrange to commission the equipment in the presence of the P.D. or his representatives. The Contractor shall demonstrate the correct operation of all mechanical and electrical aspects of the equipment, the correct operations of all controls and generally prove the installation is complete.

(emphasis added)

[15] The object of testing is obvious from cl. 47.1 which is "to prove that the equipment has been properly adjusted and calibrated to produce the required guaranteed performance as offered and that the system as a whole can perform the performance and functions as specified". Where and when the plaintiff is of the view that it has completed the installation of the system, it is the plaintiff's responsibility to arrange for the necessary testing to be done. The testing is not only of the equipment but also of the installation, all with the single purpose of ascertaining whether that which has been installed can "produce the required guaranteed performance as offered and that the system as a whole can perform the performance and functions as specified".

[16] Aside from it being the plaintiff's call as to when this testing will be conducted, it is also the plaintiff's responsibility to ensure that "necessary equipment, tools, materials, labour" as are required for the testing are provided. The costs of such provision are already included in the contract price.

[17] Since the object of the testing is to prove that the equipment and installation has been properly adjusted and calibrated to produce the required guaranteed performance as offered and that the system as a whole can perform the performance and functions as specified, the logical question that ensues is what was the guaranteed performance and functions that were offered or specified? For this, we must turn undisputedly to the TOR and the relevant provisions of the said contract.

[18] Amongst the technical specifications in the TOR, the plaintiff is to ensure the following:

(i) That the capacities of energy production from the renewable energy system comprising the wind turbine and solar energy is on a full load basis for each village;

(ii) That the load is sourced from energy produced by renewable energy sources and by the generator in the proportions of 70:30;

(iii) That the system is equipped with a current limiter which can monitor and ascertain that the use is not more than 4 KW/h for each house;

(iv) That 100% of the energy produced by the wind turbines operated at speeds of Class 2 (4-5m/s);

(v) That the autonomous 2 day capacity of the battery is designed on a full load basis which is, 4 KWh per day per house for 50 houses, or 200 KWh per day per village; and

(vi) That the capacity of the generator is designed also on a full load basis for each village. However, the generator is only to supply 30% of the energy required.

[19] The plaintiff had done its own calculations for how the 4 KWh per day for each house was to be achieved. These are the specific details of the plaintiff's own calculations for the energy generation required for Kg Telok Melano, Lundu in Sarawak as found at p. 226 of the common bundle of documents. It would appear that these calculations, with the necessary adjustments depending on the number of houses for each village, prevailed for all the villages as the TOR required the energy to be supplied to each house to be 4 KWh per day:

CALCULATION FOR SYNERGY HYBRID SYSTEM ENERGY GENERATION
KG TELOK MELANO, LUNDU, SARAWAK

TOTAL LOAD	
Energy to be supplied (per house)	4 KWh/Day
Total energy to be supplied (59 houses)	236 KWh/Day
Renewable energy required (70% of total power)	165.2 KWh/Day
Generator set energy contribution (30% of total power)	70.8 KWh/Day
HYBRID SYSTEM OUTPUT	
WIND TURBINE	
Alternator rating	2.5 KW
Effective generation hours	12 hrs/day
Total Energy Generation per unit	30 KWh/day
No of wind turbine	6 units
Total Energy Generation per unit	180 KWh/day
SOLAR PANEL	
Solar panel rating	180 W
Effective generation hours	8 hrs
total Energy Generation per unit per	1.44 KWh/day
No of Solar Panel	10 units
Total Energy Generation Per System	14.4 KWh/day
TOTAL RENEWABLE ENERGY GENERATION	194.4 KWh/day
GENERATOR SET OUTPUT	
Generator Set Rating	15 Kva
Power Factor (PF)	0.8
Rating with PF	12 KW
Effective Generation Hours	5.9 Hrs
Total output required	70.8 KWh/day
COMPARISON	
Renewable Energy	
Required	165.2 KWh/day
Supplied by Synergy Hybrid System	194.4 KWh/day
Difference (Excess Energy Supply)	29.2 KWh/day
Generator Set	
Required	70.8 KWh/day
Supplied by Synergy Hybrid Genset (5.8 hrs/day)	70.8 KWh/day
CONCLUSION	
SPM Wind/Solar/Diesel Hybrid system is design sufficiently to supply to 62 houses with 4 KWh/day load as required by Terms of Reference in Contract.	

[20] From the plaintiff's own calculations, for a total load of 4 KWh per day or 236 KWh per day for a village of 59 houses, 165.2 KWh per day or 70% of that energy will be produced or supplied by the renewable energy comprising of wind turbine and solar panel, while 70.8 KWh per day or 30% of that energy will be produced by the generator set.

[21] Further, each unit of wind turbine in the hybrid system of wind turbines and solar panels, operating for 12 hours per day, is capable of producing 30 KWh per day. With the deployment of six units of such wind turbines, the total energy produced will be 180 KWh per day. As for the solar panels, each unit operating for eight hours per day is capable of generating 1.44 KWh per day. With ten units of solar panels deployed, 14.4 KWh per day would be generated. This brings the total energy generated from both wind turbines and solar panels to 194.4 KWh per day. As for the generator set, it is effective for 5.9 hours and is expected to produce 70.8 KWh per day.

[22] Since the total energy required from renewable energy is only 165.2 KWh per day but the renewable energy sources can produce 194.4 KWh per day, there will be an excess energy supply by 29.2 KWh per day. Together with the 70.8 KWh per day supplied by the generator set, the whole system was said to be more than able to produce the total energy of 236 KWh per day for the whole village of Kg Telok Melano. More importantly, these wind turbines could operate to generate energy even though the wind speeds were "at a very low speed".

[23] As was pleaded and testified by all the witnesses called, tests were carried out. It is PW1's evidence that the plaintiff had fulfilled the requirements of cl. 47 read together with the TOR and thereby meeting its own calculations as found at p. 226; whereas the defendants' witnesses say otherwise. The court will now examine what happened during and at those tests.

[24] A total of seven tests were conducted on all the four villages. The bulk of these tests were conducted at Kg Telok Melano for a practical reason - only the houses in this village had been wired. The houses in the other three had not been. The plaintiff argued that it is not within its scope of works to wire the houses. From the positions taken at trial, it would appear that this is correct. That, however, does not detract from the issue at hand as the hybrid system in all four villages had to be tested and commissioned before the plaintiff could make its claim on the last sums due under the said contract. The evidence does not show the plaintiff protesting on the requirement of testing and commissioning in the other three villages on the basis that the houses were not wired. Instead, the plaintiff was quite happy to proceed with the testing and commissioning even without the wiring. It is the view of the court that nothing turns on this. What is important was whether tests could be carried out regardless. I shall deal with this when we examined the position in those three villages.

[25] As for the testing done at Kg Telok Melano, it is the court's view that it is actually unnecessary that all tests be reviewed. By necessary implication and by virtue of the records, further tests were called for because each preceding test had either failed or could not be carried out for one reason or another. Even PW1's evidence admits to that, PW1 testified that the testing and commissioning on 12 to 13 October 2009 "gagal dilaksanakan" because the houses then had not been wired. As for the testing and commissioning on 14 to 20 December 2009, PW1 admitted that the "T & C yang dijalankan berjaya dilakukan mengikut prosedur tetapi tidak mematuhi keseluruhan TOR". It is also the court's view that successfully conducting testings and commissioning according to procedure is still a long way off from conducting successful testings and commissioning that meet the TOR and the terms and conditions of the said contract; and it is the latter that is of importance under the terms of the said contract. So, only the last two tests would be relevant and the records reflect that. These tests were conducted between 7 and 9 April 2010; and between 25 August 2010 and 2 September 2010.

[26] This is a summary of the oral testimonies of the witnesses called on the tests and commissioning done.

[27] According to Indera Shaiful bin Baharuddin (PW1) who is the executive director of the plaintiff, the plaintiff had agreed to install a hybrid remote area power system for the defendants (hybrid system). This hybrid system is an integration of three components, wind turbine, solar panel and diesel generator set; and it includes the battery bank and an intelligent control system. The system uses the wind turbine as its primary source and solar as its secondary source for energy generation. The diesel generator set is a standby source if there is a sudden need of high battery recharging rate due to excessive usage at any period of time. The concentration of the system is its primary source, the wind. In a typical system, the proportions of energy generation from the various sources would be approximately 70% from both the primary and secondary sources; and the remaining 30% drawn from the diesel generator set.

[28] In relation to the tests conducted between 7 and 9 April 2010; and between 25 August 2010 and 2 September 2010, this is what PW1 told the court. According to him, all testing and commissioning were successfully conducted. He claimed that the plaintiff could not be faulted if testing and commissioning could not be done in all four villages since the wiring of the houses in these villages fell outside the plaintiff's scope of works. As for the outcome of these tests, he relied on the reports prepared by the plaintiff's consultant, Mega Jati Consult Sdn Bhd (Mega Jati). The consultant however, was not called to testify. Instead, PW1 who did not personally attend any of the testings and commissioning conducted in any of the villages involved, testified.

[29] The defendants' three witnesses were the officers who attended the various tests at the four villages. DW1 is the Penolong Jurutera Elektrik Kanan of Bahagian Teknikal, Kementerian Kemajuan Luar Bandar dan Wilayah. DW2 is an electrical engineer with Cawangan Kejuruteraan Elektrik, Ibu Pejabat JKR Kuala Lumpur, while DW3 is an electrical engineer who represented Sarawak Energy Berhad in this contract for the purpose of "memastikan pihak kontraktor melaksanakan projek ini berdasarkan standard SESCO yang sedia ada iaitu standard untuk rekabentuk dan pembinaan sistem talian pengagihan. Saya juga ditugaskan untuk memastikan pembinaan projek ini telah mematuhi 'terms of reference' dan telah lulus dalam pengujian dan pentauliahan sebelum Sarawak Energy Bhd dapat mengambil alih projek ini untuk tujuan operasi dan penyelenggaraan". Sarawak Energy Bhd was supposed to take over the project once it had been successfully completed by the plaintiff.

[30] DW1 informed the court that the said contract was based on design and build terms. One of the most important terms of the said contract was the requirement in the TOR in relation to the capacities of the renewable energy sources. 70% of the energy generated must be sourced from the wind turbines and solar system while 30% could be sourced from the generator. This factor was critical to the defendants because the system would be located in remote villages. DW1 told the court that the defendants did not want to be dependent on generators which used diesel as the costs of supplying diesel for the generators used at these remote villages would be prohibitively high. It therefore made good sense to rely on the renewable energies of wind and solar proposed by the plaintiff.

[31] Using power analyser, tong tester and multimeter, the defendants' conducted the testing and commissioning in the presence of representatives from the plaintiff, and Sarawak Energy Bhd (SEB), who would eventually take over the said project. According to DW1, the plaintiff failed to meet the terms of the TOR despite the numerous testings and commissioning conducted. He carefully explained each testing and commissioning, the details of which can be found in the reports filed after each testing and commissioning. I shall go into the details of those reports later.

[32] DW2 also attended two of the testings and commissioning conducted - one at Kg Tinaum, Ranau, Sabah on 19 April 2010, the other at Kg Arul Dalan, Bario, Sarawak on 26 April 2010. Like DW1, DW2 was of the view that the testings and commissioning failed. She too, referred to the reports filed in relation to those testings and commissioning in support of her oral testimony.

[33] Finally, DW3. Like the two earlier witnesses, DW3 attended some of the testings and commissioning, that conducted at Telok Melano on 14 - 18 December 2009 and 7-9 April 2010; and then at Kg Arul Dalan, Bario,

Sarawak on 25-27 April 2010. He also testified that the testings and commissioning that he witnessed, failed. He also relied on the reports filed and which were produced in court.

[34] I shall now turn to the written reports produced in court and referred to by all the witnesses. There are three sets of reports prepared for the test conducted in April 2010; one report prepared by Mega Jati and found at p. 96 of the common bundles of documents; the second by Bahagian Pembangunan (Teknikal) of Kementerian Kemajuan Luar Bandar dan WiIayah (p. 121); and the third by Sarawak Energy Bhd at p. 139. All three reports were prepared following the same dates of testing. These reports must be carefully examined in detail to establish the status of the tests conducted.

[35] First, the findings of Mega Jati, in relation to the testings and commissioning at Kg Telok Melano:

> 5.0 Overall Hybrid System (Wind Turbine, Solar And Gen-Set)
>
> **The performance of the overall hybrid system was very encouraging**. The people of Kg Telok Melano enjoy some 37 hours of continuous electrical power supply plus another 13 hours of generator set supply before the breakdown/black-out. (Battery supply from 6.00 pm, 6/4/2010 until 7.00 am 8/4/2010 = 37 hours) (Gen-set supply from 7.00 am, 8/4/2010 until 8.12 pm 8/4/2010 = 13 hrs 12 min)
>
> 6.0 Battery System
>
> Battery performance throughout the T&C was satisfactory. SPM technical team begins charging the battery upon their early arrival whereby before usage the battery were measure stated at 100% /44V charged. After 37 hrs of continuous supply the generator set took-over the battery measured at 27% /44V charged.
>
> 7.0 Generator Set
>
> The generator set took-over from the battery to supply electricity to the houses at 7.00 am 8/4/2010. The built-in fuel tank with 50 litre capacity of diesel lasted for 7 hrs and 19 minutes before refuelling. It was acknowledge that the Contractor has indicated to study and to propose a suitable size of generator set to accommodate the domestic load at the same time charging the battery.
>
> 8.0 Wind Turbines
>
> **Throughout the testing & commissioning process, we finally were able to observe some contribution from the wind turbines charging the hybrid system on the 8/4/2010**. The six no. of wind turbine operates periodically at between 1 - 3 minutes, with wind turbine no. 1 (facing the sea) operates for about 30 minutes. Measuring on the average of 3 to 5 amperes, was recorded using an ammeter.

A 9.0 Inverter

The inverter system performance is stable/no breakdown and functionally well.

10.0 Cables

B The melting of the cable protective material between the battery and inverter is due to the overheating as the result of the increased electrical load connected. The usage of 'welding cable' seems to be the problem since it is not able to withstand continuous high current.

C (emphasis added)

[36] Following from those findings and test results, the plaintiff's consultants made these recommendations found at p. 101:

(a) SPM to study and implement some protection system to protect the overall hybrid system when overloading occurs;

D

(b) The usage of a suitable type of cables ie, PVC/PVC or PVC/XLPE cable to be use to replace the 'welding cable' installed to withstand continuous operating current;

[37] This was Mega Jati's conclusions found at p. 102:

E *From the above testing & commissioning exercise, the Consultant in his technical view confirms that the hybrid wind turbine/solar/gen-set work successfully. The hybrid system operates successfully for some 37 hours using battery supply and 13 hours and 12 minute using generator supply continuously, before the connection cables (protection material) melts and the system breakdown. From the record collected, the hybrid system is functionally as per intended design by the Contractor.*

F **The Contractor is required to take immediate action to rectify** the melted cable (protective material) by replacing it with a suitable type in accordance to IEE standard requirement.

The Contractor is also required to take all the necessary action to introduce some G *measuring equipment in the hybrid system, to justify the contribution of the renewable energy i.e. wind turbine and solar system, in producing the required power to the hybrid system*. To achieve/justify the requirements in the 'Terms of Reference' as stipulated in the Contract, the Consultant is in the opinion, that data/records for a time period of one (1) year cycle be collected.

H Since the hybrid system is 'one of its kind' and a 'new product' manufactured by a local manufacturer in the market, the Consultant would propose that the Contractor (as the manufacturer) to carry out the maintenance work during the 'Defect Liability period' before it is handed over to Sarawak Energy Berhad (SEB). Please take note, the fuel cost and standing supervision and monitoring at site by the Contractor was not

I included in the Contract Sum.

From the early stage, the Consultant is committed to make sure the project is implemented successfully. Thus requires the cooperation and supports from all parties involved and to be more focus on the Government responsibility to provide the people of Kg Telok Melano the basic electricity power supply.

While proving this basic need, the Contractor should be given the opportunity and flexibility to improvised/upgrade the hybrid system to accommodate the existing and the future electrical load. In several previous site meetings with KKLW being held at KKLW office, the Contractor have given their commitment to fulfil all performance requirement in the 'Terms of Reference' as stipulated in the Contract.

The resident of Kg Telok Melano should be educated by the Contractor's personnel at site on the present hybrid wind turbine/solar/gen-set system capability and limitation (electrical load) due to the performance limit i.e. 4 KWh per house as spell out in the Contract.

As the hybrid wind turbine system/technology is indigenous, all parties should come together to support the Contractor (manufacturer) to realized the Government aspiration in making Malaysia the leader in 'Green Technology' products manufacturing in line with the New Economic Model.

(emphasis added)

[38] As for Bahagian Pembangunan (Teknikal), this was its report as set out at para. E:

Ulasan/Tindakan susulan

Pihak kontraktor gagal membekalkan tenaga elektrik berterusan dan dikehendaki membaiki kerosakan kabel, memastikan sistem yang dipasang dapat beroperasi 24 jam berterusan dan memenuhi perkara-perkara berikut:

(i) Sistem penjanaan perlu mematuhi dan memenuhi syarat-syarat yang telah ditetapkan dalam 'Term of reference' (TOR).

(ii) Tenaga Elektrik yang dibekalkan dapat menampung beban waktu puncak yang mana penggunaan purata tenaga dianggarkan berjumlah 450W bagi setiap rumah dan bukannya 225W.

(iii) Memastikan kuasa yang dijana oleh wind turbine, solar dan janakuasa dapat disukat. (Tiada KWh meter dipasang).

(iv) Laporan terperinci penggunaan hendaklah disediakan oleh juruperunding bagi memastikan penggunaan bekalan 70% dari RE dan 30% janakuasa.

[39] At paras. 3.0 and 4.0 of its report, Sarawak Energy Bhd reported:

3.0 Testing Activities

3.1 It is reported by SPM that the system started to supply electricity to the village using only the batteries at 6pm on Tuesday, 6th April 2010 with the batteries' State of Charge (S.O.C) is approximately 100%.

A 3.2 Physical inspection has been done for the powerhouse, inverter, generator, batteries and the wind turbines. The checklist forms are attached with this report.

3.3 Earthing test was done for the powerhouse. Test result is attached.

3.4 Diesel generator was operating starting at 7 am, 8th April 2010. The
B generator was used to charge the batteries and supplied the village at the same time. At that moment, generator's diesel is full (50 Litre), the SOC of the batteries was 27% and the batteries voltage was 44.4 V.

3.5 From the data sheet attached, the generator was refilled at 2 pm on the same day.

C 3.6 The village's load, generation from the solar and diesel generator was recorded starting 7 am 8th April 2010.

3.7 It is reported by KKLW, only 45 houses are using the electricity 3 families are reported not at Telok Melano from 7th - 9th April 2010.

D 3.8 Around 6.45 pm - 7 pm on 8th April 2010, it is observed some instability of the system's voltage. From the data sheet, it is stated at 6.50 pm, when the load is 11.2 KW, the generator did not charge the batteries. At 7 pm, the generator is OFF.

3.9 At 8.13 pm on 8th April 2010, the system tripped. It is observed that
E the DC cable melted at some spot inside the inverter & DC cabinet. It is recorded at the datasheet that the load at that time is more than 14 KW.

3.10 Load bank test are scheduled on 9th April 2010, Friday but not able to carry out.

F 3.11 No data were recorded from the weather station at the wind turbine near the beach.

4.0 Conclusion

4.1 The system managed to supply to 45 houses using the batteries only for approximately 37 hours (SOC 100% → 27%). But this still hasn't proved the 2 days autonomy.

G 4.2 The diesel generator's consumption is 50 Litre/7 hours.

4.3 The diesel generator is undersize. It's unable to supply for both the load and charging the battery.

4.4 The maximum load observed is more that 14 KW. The maximum demand was unable to be recorded due to tripped system. Referring
H to the data taken on 15th December 2010, the peak demand was recorded at 9.30pm.

4.5 No meter was installed for measuring the generation (KWh) from the wind turbine. Thus, the system performance (70% REN, 30% Diesel) can't be proven.

I 4.6 No testing was done on the Distribution System.

(emphasis added)

[40] It is obvious from the above reports that the testings done at Kg Telok Melano were not successful in that the terms of the TOR of the said contract relating to the guaranteed performance and functions of the system had not been fulfilled. Because of the above concerns, another set of tests were subsequently conducted at Kg Telok Melano by the plaintiff's consultant between 25 August 2010 and 2 September 2010. Its report can be found at p. 180. It would appear that the focal point of this test was on the generators as new generators were installed after the earlier ones were found to be wanting in capacity. In the course of its tests and observations, it made observations on other matters as follow:

> 4.3 Other Observation
>
> The Contractor confirms that all repair and maintenance works has been carried out on the damaged wind turbines. The T & C team was able to observe some inputs from the wind turbines, which measured from the range of 10 Amp to 20 Amps. All the wind turbines seem to be operating and functional well. However, the actual contribution by the wind turbine to the overall system can only be measured accumulatively over a certain determined period of time.

[41] The plaintiff's consultant then made the following conclusion and recommendation:

> From the site visit and testing & commissioning process carried out, the hybrid wind turbine/solar/gen-set system is ready to provide energy to the existing domestic needs i.e. within its installed design capacity and settings.
>
> From the above testing & commissioning exercise, the Consultant in his technical view confirms that the hybrid wind turbine/solar/gen-set work successfully. **The Consultant proposed that after a certain specific period of 'test run', of which data and results could be collected**, with domestic user response to the usage limits being collected. **By then only can we determine the actual justification to fulfil the contractual and the technical requirement**.
>
> (emphasis added)

[42] In the case of the remaining three villages, the report from the ministry can be found at p. 145 while the report which was prepared by Mega Jati can be found at p. 153. Again, these tests were carried out in the presence of representatives of both parties. I shall set out the detailed findings of each village as prepared by the defendants:

Kg Mengkapoh, Ranau, Sabah

> (2) Keputusan ujian
>
> (i) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 10 KW iaitu mulai jam 2.45 petang - 3.00 petang.

A Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(ii) Sistem terpasang beroperasi berterusan selama 15 minit bagi
B beban 11 KW iaitu mulai jam 3.00 petang - 3.15 petang.

Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

C (iii) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 12 KW iaitu mulai jam 3.15 petang - 3.30 petang.

Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti
D (SOC) bateri belum 50%.

(iv) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 13 KW iaitu mulai jam 3.30 petang - 3.45 petang.

Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan
E yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(v) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 14 KW iaitu mulai jam 3.45 petang - 4.00 petang.

Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada
F meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(vi) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 15 KW iaitu mulai jam 4.00 petang - 4.15 petang.

G Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(vii) Sistem terpasang beroperasi berterusan selama 40 minit bagi
H beban 16 KW (maksima) iaitu mulai jam 4.15 petang - 4.55 petang.

Inverter trip pada jam 4.55 petang kerana lampau panas (over heating). Bekalan elektrik 40 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana
I dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

Kg Tinaum, Ranau, Sabah

(2) Keputusan ujian

(i) Sistem terpasang beroperasi berterusan selama 45 minit bagi beban 4.6 KW iaitu mulai jam 12.30 tgh hari - 1.15 petang.

Bekalan elektrik 45 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(ii) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 7.3 KW iaitu mulai jam 1.15 petang - 1.30 petang.

Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(iii) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 9.2 KW iaitu mulai jam 1.30 petang - 1.45 petang.

Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(iv) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 10.9 KW iaitu mulai jam 1.45 petang - 2.00 petang.

Bekalan elektrik 15 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(v) Sistem terpasang beroperasi berterusan selama 15 minit bagi beban 12.6 KW iaitu mulai jam 2.00 petang - 2.05 petang.

Bekalan elektrik 5 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(vi) Sistem terpasang beroperasi berterusan selama 85 minit bagi beban 14.1 KW iaitu mulai jam 2.05 petang sehingga inverter trip pada 3.30 petang.

Bekalan elektrik 85 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

Kg Arul Dalan, Bario, Sarawak

(1) Keputusan ujian

(i) Sistem terpasang beroperasi berterusan selama 30 minit bagi beban 8.8 KW iaitu mulai jam 2.30 petang - 3.00 petang.

Bekalan elektrik 30 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(ii) Sistem terpasang beroperasi berterusan selama 30 minit bagi beban 11 KW iaitu mulai jam 3.00 petang dan inverter trip pada jam 3.30 petang.

Bekalan elektrik 30 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa beroperasi kerana inverter menghantar isyarat tetapi tidak dapat menampung beban.

(iii) Sistem terpasang beroperasi berterusan selama 29 minit bagi beban 11.2 KW iaitu mulai jam 3.31 petang - 4.00 petang.

Bekalan elektrik 29 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

(iv) Sistem terpasang beroperasi berterusan selama 90 minit bagi beban 9.8 KW iaitu mulai jam 4.00 petang dan inverter trip pada jam 5.30 petang.

Bekalan elektrik 90 minit diperolehi dari bateri dan RE. Tiada meter KWh dipasang bagi merekod jumlah tenaga dijana dan yang digunakan. Janakuasa tidak beroperasi kerana kapasiti (SOC) bateri belum 50%.

[43] At p. 152, the Ministry made the following conclusions about the testings and commissioning that had been conducted:

Pihak kontraktor gagal membekalkan tenaga elektrik berterusan dan dikehendaki mengenalpasti punca kerosakan/inverter trip dan membaikinya serta memastikan sistem yang dipasang dapat beroperasi 24 jam berterusan dan memenuhi perkara-perkara berikut:

(i) Sistem penjanaan mematuhi dan memenuhi syarat-syarat yang telah ditetapkan dalam 'Term of Reference' (TOR).

(ii) Tenaga Elektrik yang dibekalkan dapat menampung beban waktu puncak yang mana penggunaan purata tenaga dianggarkan berjumlah 450W bagi setiap rumah dan bukannya 225W.

(iii) Memastikan kuasa yang dijana oleh wind turbine, solar dan janakuasa dapat disukat.

(iv) Laporan terperinci penggunaan hendaklah disediakan oleh juruperunding bagi memastikan penggunaan bekalan 70% dari RE dan 30% janakuasa.

(emphasis added)

[44] Mega Jati had kept its report for the remaining three villages separate from that for Kg Telok Melano. The following are extracts from its report for each of these other villages as found from p. 153:

T & C conducted at Kampung Mengkapoh, Ranau, Sabah

Date: 15/4/2010 - 16/4/2010

2.2 Testing Activities

- SPM Technician conducted some service and maintenance works earlier, before the T & C was conducted;
- Joint inspection was also carried out by the team on the overall hybrid installation and equipment including the LV distribution system. SESB will issue the defect checklist to comply with SESB's standard requirements;
- T & C were carried out using the 'portable load bank';
- The team observed (visually) the performance of the wind turbine.

2.3 Test result

- Load Test - At maximum load of 16 KW (max load size for portable load bank) the hybrid system failed i.e. after 30 minutes due to the high temperature sensed by the inverter, whereby the inverter was automatically shut down.
- Wind turbine - the team observed the turbine functioning well.
- Battery system - the system seemed to respond well, during charging and discharging of power.

No further test was carried out after the break down of the hybrid system and SPM technical team to identify the problem and rectify.

T & C conducted at Kampung Tinaum, Ranau, Sabah

Date: 18/4/2010 - 20/4/2010

3.2 Testing Activities

- SPM Technician conducted some service and maintenance works earlier, before the T & C was conducted;
- Joint inspection was also carried out by the team on the overall hybrid installation and equipment including the LV distribution system. SESB will issue the defect checklist to comply with SESB's standard requirements;
- T & C were carried out using the 'portable load bank';
- The team observed (visually) the performance of the wind turbine.

3.3 Test result

- Load Test - At maximum load of 16 KW (max load size for portable load bank) the hybrid system failed i.e. after 30 minutes due to the high temperature sensed by the inverter, whereby the inverter was automatically shut down.

- Wind turbine - the team observed the turbine functioning well.
- Battery system - the system seemed to respond well, during charging and discharging of power.

No further test was carried out after the breakdown of the hybrid system and SPM technical team to identify the problem and rectify.

T & C conducted at Kampung Arul Dalan, Bario, Sarawak

Date: 25/4/2010 - 27/4/2010

4.2 Testing Activities

Date: 25/4/2010 (T & C was carried out using the 'portable load bank')

- 24 hours load test between 6.0 KW - 6.5 KW was conducted. Readings were collected at 30 minutes interval.

Date: 26/4/2010 (T & C was carried out using the 'portable load bank')

- Joint inspection was also carried out by the team on the overall hybrid installation and equipment including the LV distribution system.
- Load test between 9.0 KW - 12.0 KW was conducted. Readings were collected at 30 minutes interval.
- Visual observation of the wind turbine performance.

4.3 Test result

i. 24 hrs load test - please refer to test result

No breakdown of the hybrid system occurs. The battery system discharge continuously during the testing period between 6.0 KW - 6.5 KW load for 24 hrs.

ii. Joint inspection (overall system)

Joint inspection was carried out by the team on the overall hybrid installation and equipment including the LV distribution system. SEB will issue the defect checklist to comply with SEB's standard requirements.

iii. Load test between 9.0 KW - 12.5 KW (Source from battery system)

Stage 1:
The load test starts by loading the system at 9 KW for 1 hr;

Stage 2:
Load at 12 KW, after 30 minutes the system tripped and generator set fails to take over the load. Indicating low AC voltage - at the generator set system.

After resuming the test run, the system tripped again at the load of 12 KW and again the generator set to take over the testing load. Indicating low AC voltage at the generator set system.

iv. Wind Turbine system

The status/availability of the 4 no. of wind turbines installed is as follow:

WT1: Not functioning, anchor block & support cable dislodged due to soft ground/wet soil;

WT2: Responded well, inputs were observed by ammeter;

WT3: Blades turns, no input measured due to disconnection of cable from wind turbine to power house;

WT4: Blades turns, no input measured due to disconnection of cable from wind turbine to power house.

No proper data logging data were recorded because no KWh meters were installed.

[45] Mega Jati's comments, recommendations and conclusions at pp. 161 and 162 are particularly insightful:

Based on the above findings and test result collected during the testing & commissioning process, the Contractor is advised/recommended to consider the following:

1. The Contractor (SPM) to thorough the checklist prepared by SESB and SEB and to refer to the requirement as stipulated in the Contract with regards to Contractor's compliance to SESB and SEB requirements;
2. SPM to carry out modification/implementation where necessary, which will effect the proper operation of the overall hybrid and LV distribution system;
3. SPM to focus on the diagnosis of the constant breakdown of the system during the T & C process for all three (3) sites, especially the inverter temperature, high/low AC voltage identified which contribute the premature stoppage of the T & C;
4. SPM to immediately carry out repair works and make good all the 'faulty' wind turbines.
5. SPM is advised to install KWh meter (AC or/and DC meters) at specific location in the hybrid system, in order to access the contribution of the renewable energy. As for Kg Telok Melano, Sarawak, KWh meter to be installed at the output of the hybrid system.
6. SPM is also advised to carry out preliminary T & C after the repair works being done, by means of conducting a reliability test run for at least 48 hours or more with vary loads and to ensure no breakdown will occurs during the official T & C.

(emphasis added)

[46] First and foremost, the above documentary evidence prepared contemporaneously confirmed the evidence of the defendants' witnesses. All three witnesses gave corroborative and consistent testimonies. DW1, DW2 and DW3 were members of the technical teams for the villages involved and their evidence have been firm, credible, and consistent. The plaintiff had invited the court to reject their evidence on the basis that they did not understand the system, partly because they were not present at the very beginning when the plaintiff first made its presentations to the defendants.

[47] With respect, while these witnesses may not have been present when the plaintiff first explained its system, the court does not find this inhibiting in any manner whatsoever. These witnesses have been totally professional in their conduct and approach; and were merely evaluating the testings and commissioning against the terms of the TOR and the said contract. They gave their evidence calmly and credibly, leaving the empirical data collected from the various tests to speak for themselves. That empirical data is as reflected in the reports which have been set out earlier. That empirical data is further supported by those collected by the plaintiff's own consultant. Compared to PW1 who was really relying on Mega Jati's reports with no personal knowledge of the tests conducted, the defendants' witnesses are witnesses of facts learnt first-hand and certainly, more believable than PW1's testimony.

[48] As remarked earlier, the tests at Kg Telok Melano are critical given that it is the only village where the houses involved had been wired and so could take part in the tests. As for the other villages, while the wiring for these villages may not have been the responsibility of the plaintiff's, there is no evidence that the tests could only be carried out after the houses had been wired. Given that it is the system that was under observation for purposes of testing and commissioning, and that the parties were looking at a typical scenario; the court is also of the view that it was reasonable that only one village was wired and the manner and conditions under which the testings and commissioning for the remaining three villages were conducted, were not hampered by this.

[49] After the tests in April 2010, the plaintiff's own consultant made recommendations for further action. Such action included the very comments and concerns raised by the defendants had testified that there were no meters for the measuring and recording of the energy produced by the wind turbines and solar systems. In fact the defendants' witnesses had testified that such meters were required to measure the amount of energy supplied by the wind turbines, the primary source of energy. The provision and installation of such equipment is therefore vital and necessary for evaluating whether the equipment and installation are proved to be as offered and specified in the TOR. Since the plaintiff is responsible for providing the equipment for testings and commissioning, which equipment must include such meters, it is in the plaintiff's own interest that such equipment be provided. Yet, none were provided. There is a curious absence of

explanation as to why this equipment was not supplied. Under such circumstances, the plaintiff cannot now complain. I must add that although PW1 and learned counsel for the plaintiff had tried to make some issue out of the absence of meters being marked or drawn into the relevant drawings, I do not find or regard that as of any material consideration. What is, are the concerns raised by the defendants which I find entirely relevant, valid and of merit.

[50] Further, the defendants' conduct in nevertheless measuring the energy generated by the solar panels even though there were no meters for measuring the energy generated by the wind panels hints at the level of professionalism exhibited on the part of the defendants' witnesses. It also puts paid to the plaintiff's suggestions of some ulterior motive or lack of co-operation on the part of the defendants' officers.

[51] The court also finds that the plaintiff's explanation that the testing on a dummy load was not feasible does not hold water and is illogical. Even the plaintiff and plaintiff's own consultant, Mega Jati, have not found that to be of any adverse concern, that it was still doable to carry out the testing and commissioning with dummy loads - see para. 27 of the reply. In fact, dummy loads or simulations are the practical solutions for tests and commissioning provided that the appropriate margins and parameters are calibrated into such models or loads.

[52] Coming back to the reports themselves, it is evident that these reports prepared by both parties show that careful and controlled tests were conducted in the presence of both parties. It is further clear from these reports that the findings for each village reveal that the hybrid system had failed. The system frequently "tripped" and the generator sets installed for taking over the load themselves, failed. Even though the teams were able to visually observe the performance of the wind turbines, there were nevertheless wind turbines that were either not functioning or their input could not be measured due to disconnections of cables; or simply due to a lack of meters for measuring their input.

[53] The upshot of all this is that it is clear from the above tests and results of those tests for Kg Telok Melano and all the other villages that the testings and commissioning have failed. This was in fact the view of the plaintiff's own consultant who, if it were otherwise, that the plaintiff had passed those tests and that the system could then be commissioned, the consultant would have said so clearly and emphatically. As highlighted in the various reports, the language of the plaintiff's own consultant is instead, extremely cautious and guarded. At no time did the consultant conclude that the tests met the terms of the TOR. Each conclusion and recommendation is never unreserved or unequivocal. Each conclusion comes with a recommendation for further test or work or supply so that the "actual justification to fulfil the contractual and the technical requirement" can be determined. Even in its overall comments, recommendations and conclusions, the plaintiff's own consultant

had given the plaintiff no less than six pieces of advice and/or recommendations, with the last recommendation hinting at an "official T&C" yet to be done. The comments, recommendations and conclusions of the plaintiff's own consultant in fact echo those of the defendant's technical teams.

[54] In any case, from the empirical data, I agree with the evidence of the defendants' witnesses that the energy emitted from the solar panels fell below that warranted by the plaintiff itself. Instead of producing 14.4 KWh per day, the solar panels were only able to produce around 9 KWh per day. As for the generator set, it was supposed to contribute 70.8 KWh per day. The readings however showed that it was producing 130 KWh per day, that is, more than it was supposed to. The court accepts and finds it reasonable that the testings and commissioning evaluated, amongst others, the contribution and distribution of energy generated from the various sources. Since the sources of energy was central and critical to the system, it was fair and reasonable for the defendants to require proof that the basic terms and requirements of the TOR and the said contract have been met. There is no helpful evidence on this for PW1. Given such empirical data with no information or clarification to contradict or explain otherwise, the court accepts the evidence of the defendants' witnesses.

[55] Although the court appreciates and understands that the battery stores the energy produced from all the primary, secondary and standby sources, the defendants' concerns about proof of the proportions contributions or distributions of such production is reasonable since the requirement on the generation of energy from these sources was such a critical and material element in the said contract, especially in the TOR. The defendants' request, which was adopted by the plaintiff's own consultants, for a KWh meter installation so that measurement of the energies generated is fair and reasonable. Since there is no other evidence of that contribution, the plaintiff cannot be said to have met the requirements of cl. 47.

[56] It is the court's findings that the plaintiff had failed to comply with the terms and conditions of the TOR and the said contract as it had failed the various tests carried out. The fact that the plaintiff had to carry out so many tests is in itself evidence that the first of the tests had failed, requiring therefore further tests. The fact that the last test for Kg Telok Melano failed is also evidenced by the meetings conducted between the parties, especially the meeting held on 5 August 2012 where the specific issue of the tests and the plaintiff's progress claim were discussed. The minutes, which are not in dispute, and which the plaintiff did not correct at any time, reveal that despite the plaintiff's position, the meeting had concluded with further tests to be carried out for various reasons. The correspondences from the defendants have been tendered in court but for some unexplained reason, the responses or the letters from the plaintiff are not before the court.

[57] Regardless, it is apparent from the trail of correspondence exchanged between the parties that the matter of the testing and commissioning under the terms of the said contract remained unfulfilled. It was not enough that a system works on papers, it had to work on the scale ordered. Hence, the requirement for testing and commissioning. With the abundance of records reflecting the numerous failures, most critical of which was that concerning the sources of energy, the conditions of the TOR and the said contract have simply not been met.

[58] In the circumstances, the court does not find the plaintiff as having discharged its burden of proving its case on a balance of probabilities - *Johara Bi Abdul Kadir Marican v. Lawrence Lam Kwok Fou & Anor* [1980] 1 LNS 199; [1981] 1 MLJ 139. The issue must be answered in the defendants' favour. The plaintiff's claim is accordingly dismissed with costs of RM30,000 as suggested by both counsels.